Many growers are already using wood components in their substrates.

By Brian E. Jackson

# *The pros of* processed pine

Continued research confirms that pine wood is a reliable source of sustainable substrate components in the foreseeable future.

As all aspects of horticultural crop production continue to improve and evolve, research and development of soilless substrates is also keeping pace with our ever-changing and demanding production practices. Processed pine and fir bark has been the primary substrate component for nursery growers across the country for several decades, a trend that holds true today. While bark is in many ways an ideal material for growing plants in containers outdoors, there has been an interest in discovering and investigating other materials that could possibly serve the same function.

Some alternative materials of interest have included composts, agricultural wastes, and wood products. Some reasons for the interest in alternative materials have been 1) due to bark shortages in certain years, 2) the threat of bark no longer being a waste product of the forestry industry and available for horticultural use, 3) cost savings, 4) improved growth

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Precise engineering and processing can create very specific and very different wood materials. All wood materials cannot be used (or assumed) the same.

**WOOD IS NOT WOOD IS NOT WOOD, JUST AS PEAT IS NOT PEAT IS NOT PEAT OR ANY OTHER MATERIAL IS NOT ALWAYS THE SAME.**

performance, and 5) attempts to make use of existing raw materials/products/byproducts that are abundantly available. During the past 40 years there has been an extensive amount of research conducted by academic scientists, growers, and soil/substrate manufacturers to investigate the potential of materials other than bark to use for nursery crop production. None have received the attention, or shown the promise that freshly harvested and processed pine trees have. The idea of using fresh, non-aged or composted, wood materials in containers is not a new concept. In fact, the use of wood fiber and other wood components in growing media dates back to the late '80s and early '90s when they were first developed and utilized in Europe. It wasn't until 2004 that the idea crossed the pond and gained interest here in the U.S. In the decade-plus since research began here in the U.S., numerous academic and industry R&D programs have evaluated various wood materials as potential alternatives to peat moss and perlite (greenhouse crops) and pine bark (nursery crops). Pine tree substrates (PTS), wholetree substrates (WTS) and clean chip residual (CCR) are all recent products/developments that have changed the culture of our horticultural production industry, both for greenhouse and nursery crops.

## Slow to switch

To date, very few nursery growers have converted to wood substrates or wood-containing substrates because pine bark has remained abundant and relatively cheap in recent years. There has been no economic incentive to switch to a substrate containing wood which may lead to needed changes in production practices. Most of the current interest, adoption, and commercialization of wood substrate materials has been in the greenhouse industry where peat moss and perlite remain expensive and supply issues are often a concern. It should be reassuring that based on all the research conducted on nursery crops (and there has been a lot) that if bark is ever in short supply or becomes too expensive, wood (processed pine trees) does provide potential solutions. One of the most impressive and consistent observations of hundreds of trials across the U.S. has been the vigorous (often enhanced) root growth of woody and herbaceous crops. The enhanced root development is due to the higher porosity of substrates containing wood components and also by virtue of the physical structure of the wood fibers/particles, which provide roots with uninhibited pathways to grow and explore the container substrate volume quicker than in substrates that contain the flattened/platy bark particles. Quickness to root in the propagation phase of nursery crop

production could add significant benefits to any grower's operation.

### Production observations

A few notes about using wood in nursery substrates: 1) incorporations of less than 40 percent typically do not change many/any production practices in regards to fertility or irrigation (depending of course of current fertility and irrigation practices); 2) loblolly pine is the best tree species for use, not hardwoods; 3) substrates containing wood do break down over time, as does pine bark; 4) no severe/enhanced degradation is known to occur as long as it is not mixed with a manure or other high nitrogen content material; 5) increased pH is often seen in mixes containing higher percentages of wood due to the inherent chemical properties of pine wood; 6) there are many machines and processes that can grind trees and make small wood particles, but they are not the same and not all work the same; 7) substrate drainage and drying characteristics will likely be different than a 100 percent pine bark substrate (needing less water per cycle but more frequently); 8) termites have never been shown to infest a container or be a problem once plants are planted in the landscape; 9) landscape establishment of 1-15 gallon plants grown in substrates containing wood materials

Pine bark can be blended with wood components and used at different ratios. Top row left to right: Pine bark 100%, 80%, 60%. Bottom row left to right: Pine bark 40%, 20%, 0%.

(even as high as 100 percent) is the same as plants grown in pine bark; and 10) the type/size/grind/percent of wood material blended with pine bark should be based on the size of pine bark being used, size of container being used, type of plant grown, and intended longevity of the crop in the pot.

One important thing to remember is that wood is not wood is not wood, just as peat is not peat is not peat or any other material is not always the same. Variations exist with different products. The finer and more different the wood particles are, the more variable they will be in relation to how they behave in a substrate. Different wood components have not always existed. During the past several years, many different wood components have been designed, engineered/processed, and evaluated which has led to greatly furthering the potential of these materials in present-day growing substrate formulations.

## Focused research

Research strategies have advanced significantly from the initial strategy/mentality of "find it, grind it, put it in a pot, and see what happens" to very precise product development methodologies that are in practice today. After realizing that fresh (non-composted or aged) wood components were viable as alternative substrate materials, more technical assessments of chemical, physical, hydrological, and bio-

## SUBSTRATES

**LEFT:** Wood-based nursery substrates can have desirable physical and chemical properties, and be stable, just as we expect from pine bark substrates.

**BELOW:** Wood substrates have been shown for many years to promote excellent root growth in nursery crops.

logical properties have been conducted. Any one of these properties could be different with different wood components that have different shapes, sizes, origination from different tree species, have been aged/stored, dried or not dried, etc.

Much of the current focus (R&D) is on engineering principles to better address consistency and reproducibility concerns and opportunities. As part of the engineering research at North Carolina State University, we work with various types of equipment to process harvested trees including tree chippers and grinders as well as various machines to further grind/pulverize the wood feedstock material. Understanding the variables and variations on how these different machines create different end-products is very important.

Despite the traditional uses (pulp, paper, timber, fuel, etc.) and more recent uses (wood pellets, biofuels, etc.) of pine trees in the U.S., it is still believed that pine wood is a reliable source of sustainable substrate components in the foreseeable future. The Southeastern U.S. is one of the most abundant wood producing regions in the entire world and production (acreage) continues to be more productive thanks to innovations in tree genetics and silviculture practices.

Much work continues at NCSU in the Horticultural Substrates Laboratory and at the Substrate Processing and Research Center (SPARC), which was constructed in 2014, to better investigate the engineering and utilization of wood, bark, and other organic substrate components. Nursery substrate research will also be on full display and thoroughly discussed as one of the main topics at the International Symposium on Growing Media, Soilless Cultivation, and Compost Utilization event which will be held in Portland, Ore., Aug. 20-25, 2017. This symposium is part of the International Society for Horticultural Science and will focus on all aspects of growing media and soilless cultivation. It welcomes all substrate research scientists, growers, and industry professionals from around the world. **NM**

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